San Jose Federated and San Jose Police & Fire Retirement

Capital Markets Expectations and 2019 Asset Study

MEKETA INVESTMENT GROUP
5796 ARMADA DRIVE SUITE 110 CARLSBAD CA 92008
760 795 3450 fax 760 795 3445 www.meketagroup.com

Background

- Each year, Meketa Investment Group produces an Annual Asset Study, which seeks to project a long-term (20-year) expected return, standard deviation, and correlation for each investable asset class. We produce 10-year expectations as well.
- This document reviews our Annual Asset Study process, as well as how the 2019 Annual Asset Study impacts the long-term expected return for the San Jose Federated City Employees' Retirement System and the City of San Jose Police and Fire Department Retirement Plan. The study's results show that the annualized expected returns for both portfolios have increased while the expected standard deviations for both portfolios have decreased.
  - The Federated System's expected return went from 7.3% using our 2018 assumptions to 7.8% using our 2019 assumptions, while the expected standard deviation has decreased from 12.3% to 11.6%.
  - The Police and Fire Plan's expected return went from 7.1% using our 2018 assumptions to 7.5% using our 2019 assumptions, while the expected standard deviation has decreased from 11.8% to 11.0%.
- This document also includes information on other firms' capital market assumptions, the historical accuracy of our expectations, and how the asset classes have actually performed.

Annual Asset Study Process

Each year, we review and set our capital market expectations.

- This involves setting long-term expectations for a variety of asset classes for:
  - Returns
  - Standard Deviation
  - Correlations
- Our process relies on both quantitative and qualitative methodologies.
- This document represents a selection of information and results from our 2019 Annual Asset Study.

Asset Class Definitions

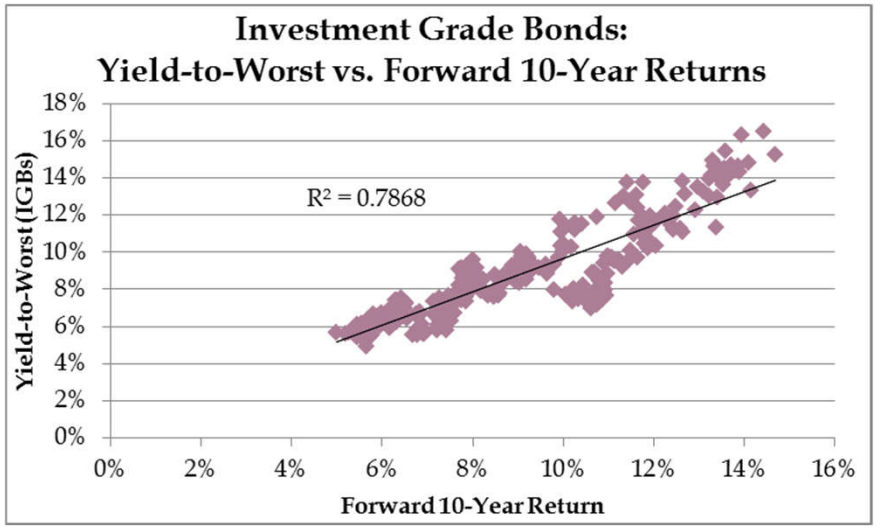
- Meketa Investment Group utilizes an approach that identifies asset classes and strategies that are appropriate for long-term allocation of funds, and that also are investable.
- Three considerations influence this process: unique return behavior, an observable historical track record, and a robust market.
- We then make forecasts for each unique asset class or strategy.

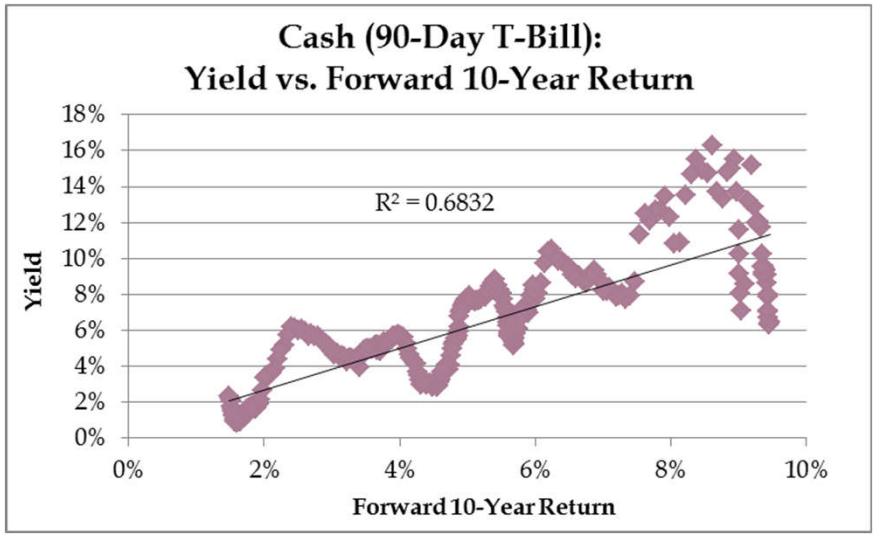
The first step is to build our 10-year forecasts

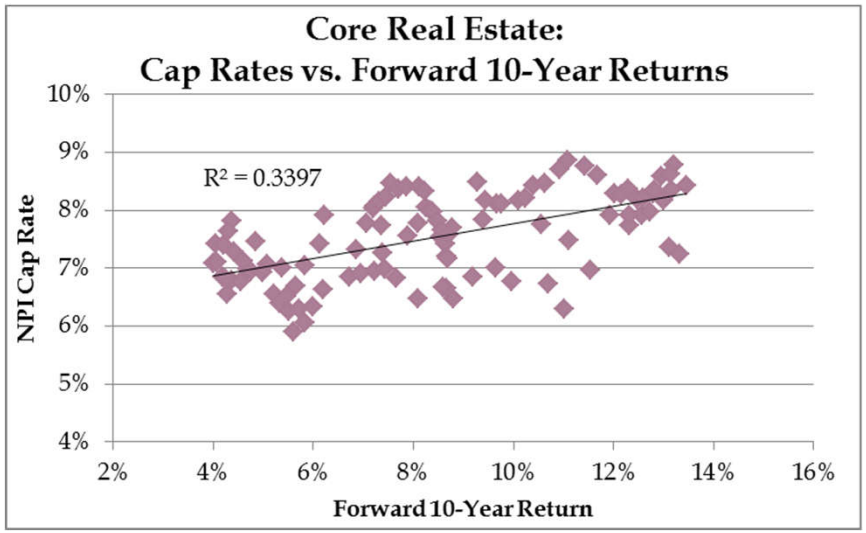
- Our fundamental models are primarily valuation based
  - Each model falls in one of eight groups, based on the most important factors that drive their returns:

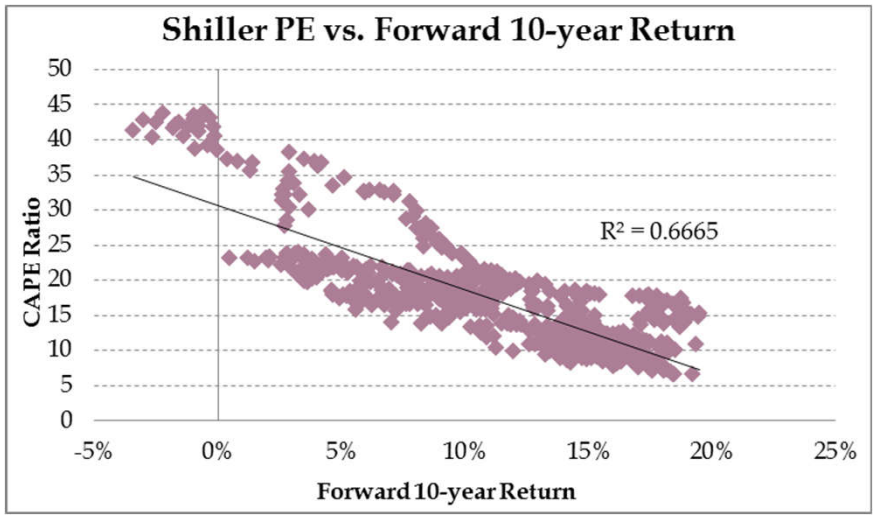
Asset Class Category	Major Factors
Equities	Dividend Yield, GDP Growth, Valuation
Bonds	Yield to Worst, Default Rate, Recovery Rate
Commodities	Collateral Yield, Roll Yield, Inflation
Infrastructure	Public IS Valuation, Income, Growth
Natural Resources	Price per Acre, Income, Public Market Valuation
Real Estate	Cap Rate, Yield, Growth
Private Equity	EBITDA Multiple, Debt Multiple, Public VC Valuation
Hedge Funds and Other	Leverage, Alternative Betas

Some models are naturally more predictive than others









The next step is to move from 10-year to our 20-year forecasts

- We do this by combining our 10-year forecasts with the historical returns for each asset class.
  - How much we apply to each depends on our confidence in them (both the model & the data).
    - The 10-year model weighting varies between 50% and 100%.
    - It only hits 100% when there is a lack of reliable historical data.
- We then infer a forecast of 10-year returns in ten years (i.e., years 11-20).
  - This allows us to test our assumptions with finance theory.
  - Essentially, we assume mean-reversion over the first ten years (where appropriate), and consistency with CAPM thereafter.

The final step is to make any qualitative adjustments

- Meketa Investment Group's internal Investment Committee reviews the output and may make adjustments due to:
  - Quality of the underlying data
  - Confidence in each model
  - External inputs (e.g., perceived risks)

Capital Market Assumption Development Example: Equities

- We use a fundamental model for equities that combines income and capital appreciation.

E(R)=Dividend Yield + Expected Earnings Growth + Multiple Effect + Currency Effect

- Meketa Investment Group evaluates historical data statistically to develop expectations for dividend yield, earnings growth, the multiple effect and currency effect.
- Our models assume that there is a reversion to the mean pricing over long time periods.

Capital Market Assumption Development Example: Bonds

- The short version for investment grade bond models is:

E(R)=Current YTW (yield to worst)

- Our models assume that there is a reversion to the mean for spreads (though not yields).
- For TIPS, we add the real yield of the TIPS index to the breakeven inflation rate.
- As with equities, we make currency adjustments when necessary for foreign bonds.
- For bonds with credit risk, Meketa Investment Group estimates default rates and loss rates in order to project an expected return:

E(R)= YTW - (Annual Default Rate × Loss Rate)

The other inputs: standard deviation and correlation

- Standard deviation:
  - We review the trailing fifteen-year standard deviation, as well as skewness.
  - Historical standard deviation serves as the base for our assumptions.
  - If there is a negative skew, we increased the volatility assumption based on the size of the historical skewness.

Asset Class	Standard Deviation	Skewness	Assumption
Bank Loans	6.6%	-2.3	9.0%

  - We also adjust for private market asset classes with "smoothed" return streams.
- Correlation:
  - We use trailing fifteen-year correlations as our guide.
  - Again, we make adjustments for "smoothed" return streams.
- Most of our adjustments are conservative in nature (i.e., they increase the standard deviation and correlation).

Peer Study

- Annually, Horizon Actuarial Services, LLC publishes a survey of capital market assumptions that they collect from various investment advisors.
  - In the 2018 survey there were 34 respondents[1].
- The Horizon survey is a useful tool for Board members to determine whether their consultant's expectations for returns (and risk) are reasonable.

Asset Class	10-Year Average (%)	20-Year Average (%)	MIG 20-Year (%)
U.S. Equity (large cap)	6.1	7.4	7.3
Non-U.S. – Developed	6.7	7.7	7.1
Non-U.S. – Emerging	7.6	8.8	9.4
U.S. Corporate Bonds – Core	3.4	4.5	4.2
U.S Corporate Bonds – High Yield	4.8	5.8	5.4
Non-U.S. Debt – Developed	2.2	3.2	2.1
Non-U.S. Debt – Emerging	5.0	6.1	5.4
U.S. Treasuries (cash)	2.5	3.1	2.9
TIPS	2.9	4.0	3.3
Real Estate	5.9	6.7	5.5
Hedge Funds	5.0	6.2	5.2
Commodities	4.0	4.9	4.6
Infrastructure	6.6	7.1	6.6
Private Equity	8.3	9.5	9.3
Inflation	2.2	2.5	2.7

[1] The 10-year horizon includes all 34 respondents and the 20-year horizon includes 13 respondents.

2019 Asset Allocation Expectations

Federated Year-over-Year Comparison

Fed Asset Allocation	2018 Policy (%)	2019 Policy (%)	Change
Expected Return	7.3	7.8	+0.5
Standard Deviation	12.3	11.6	-0.7
Sharpe Ratio	0.36	0.42	+0.06

- Meketa Investment Group's long-term (20-year) annualized expected return for the Federated System has increased from 7.3% using our 2018 assumptions to 7.8% using our 2019 assumptions.
- The portfolio's expected standard deviation has decreased from 12.3% to 11.6%.
- Given the market correction that occurred in late 2018, most asset classes now have improved valuations relative to a year ago, as well as wider spreads and higher yields on fixed income. Some private markets asset classes also now have a lower expected fee impact than in the past.

Police and Fire Year-over-Year Comparison

P&F Asset Allocation	2018 Policy (%)	2019 Policy (%)	Change
Expected Return	7.1	7.5	+0.4
Standard Deviation	11.8	11.0	-0.8
Sharpe Ratio	0.35	0.42	+0.06

- Meketa Investment Group's long-term (20-year) annualized expected return for the Police and Fire Plan has increased from 7.1% using our 2018 assumptions to 7.5% using our 2019 assumptions.
- The portfolio's expected standard deviation has decreased from 11.8% to 11.0%.
- Given the market correction that occurred in late 2018, most asset classes now have improved valuations relative to a year ago, as well as wider spreads and higher yields on fixed income. Some private markets asset classes also now have a lower expected fee impact than in the past.

Expected Return Year-over-Year Comparison

Asset Allocation	Federated Policy (%)	P&F Policy (%)	2018 Expected Return (%)	2019 Expected Return (%)	Change	Notes
Growth	**58**	**56**	**--**	**--**	**--**	**--**
Public Equity	**30**	**31**	**--**	**--**	**--**	**--**
U.S. Equity	13	13	7.3	8.1	+0.8	Better Valuations (Lower Prices & Stronger Earnings)
International Equity	7	8	7.1	8.5	+1.4	Higher Dividend, Better Valuations
Emerging Markets Equity	10	10	9.4	10.4	+1.0	Higher Dividend, Better Valuations
Private Markets	**25**	**22**	**--**	**--**	**--**	**--**
Private Equity	15	12	9.3	10.1	+0.8	Lower Fee Impact and Lower Prices
Private Debt	4	4	6.7	7.3	+0.6	Higher Yields and Lower Fee Impact
Private Real Estate	3	3	6.9	7.5	+0.6	More Leverage and Lower Fee Impact Expected
Private Real Assets	3	3	6.6	6.5	-0.1	Higher Borrowing Costs, Lower Income and Fee Impact
Emerging Markets Debt	**3**	**3**	5.1	5.3	+0.2	Higher Yields
Zero Beta	**32**	**32**	**--**	**--**	**--**	**--**
Absolute Return	7	7	5.2	5.4	+0.2	Better Equity Valuations & Higher Yields, Offset by Flatter Curve
Short Term Inv. Grade Bonds	20	20	3.1	3.4	+0.3	Higher Yields
Immunized Cash Flows	5	5	2.9	2.9	--	Higher Rates Already Anticipated at Short End in 2018
Other	**10**	**12**	**--**	**--**	**--**	**--**
Core Real Estate	5	5	5.5	5.8	+0.3	Higher Income Assumption
Sovereign Bonds ex-U.S.	--	3	2.1	2.3	+0.2	Slightly Higher Yields
Commodities	3	2	4.6	5.0	+0.4	Higher Cash (Collateral) Yield
TIPS	2	2	3.3	3.6	+0.3	Higher Real Yields

- The table above lists the 20-year return expectations for each asset class.

Standard Deviation Year-over-Year Comparison

Asset Allocation	Federated Policy (%)	P&F Policy (%)	2018 St. Deviation (%)	2019 St. Deviation (%)	Change
Growth	**58**	**56**	**--**	**--**	**--**
Public Equity	**30**	**31**	**--**	**--**	**--**
U.S. Equity	13	13	18.0	17.0	-1.0
International Equity	7	8	20.0	19.0	-1.0
Emerging Markets Equity	10	10	25.0	24.0	-1.0
Private Markets	**25**	**22**	**--**	**--**	**--**
Private Equity	15	12	27.0	26.0	-1.0
Private Debt	4	4	17.0	15.0	-2.0
Private Real Estate	3	3	19.0	18.0	-1.0
Private Real Assets	3	3	23.0	21.0	-2.0
Emerging Markets Debt	**3**	**3**	13.0	12.5	-0.5
Zero Beta	**32**	**32**	**--**	**--**	**--**
Absolute Return	7	7	8.5	7.0	-1.5
Short Term Inv. Grade Bonds	20	20	1.5	1.0	-0.5
Immunized Cash Flows	5	5	1.0	1.0	--
Other	**10**	**12**	**--**	**--**	**--**
Core Real Estate	5	5	12.0	11.0	-1.0
Sovereign Bonds ex-U.S.	--	3	9.0	8.0	-1.0
Commodities	3	2	18.0	17.0	-1.0
TIPS	2	2	7.5	7.0	-0.5

- The table above lists the 20-year standard deviation expectations for each asset class.

Asset Class Multiple Firm Comparison

Expected Return	BlackRock[1] 5 Yr (%)	Goldman Sachs[1] 5yr (%)	Morgan Stanley[2] 5 Yr (%)	GMO[1,3] 7 Yr (%)	Verus[4] 10 Yr (%)	Meketa 10 yr (%)	Meketa 20 Yr (%)
Global Equity	9.6	4.0	7.0	2.9	6.8	7.8	8.6
U.S. Equity	6.9	3.0	5.5	-0.1	5.6	6.3	8.1
Emerging Markets Equity	9.4	4.0	8.3	6.8	8.6	10.5	10.4
Private Equity	12.5	N/A	11.2	N/A	8.8	8.8	10.1
U.S. Fixed Income	3.3	3.0	4.4	2.2	3.3	3.3	3.9
Emerging Markets Debt	4.8	4.0	7.3	4.7	6.8	5.1	5.3
TIPS	3.3	N/A	3.8	2.2	3.0	3.2	3.6
Real Estate	6.1	N/A	8.6	1.1	6.1	6.4	7.0
Hedge Funds	6.2	4.0	6.4	N/A	4.4	4.5	5.4
Commodities	N/A	N/A	3.3	N/A	4.2	5.8	5.0

- The table above compares recently released capital markets assumptions from a variety of investment firms. Unsurprisingly, the short-term expectations tend to be lower than the long-term expectations.

1 Source: Long Term Expected Returns from Global Multi-Asset Team presentation dated December 2018.
2 Source: Capital market assumptions posted for the December 2018 San Jose Joint Investment Committee Meeting.
3 Inflation estimate has been added to real return expectation assumptions.
4 Source: Verus' 2019 10-year capital markets assumptions.

Total Portfolio Multiple Firm Comparison[1]

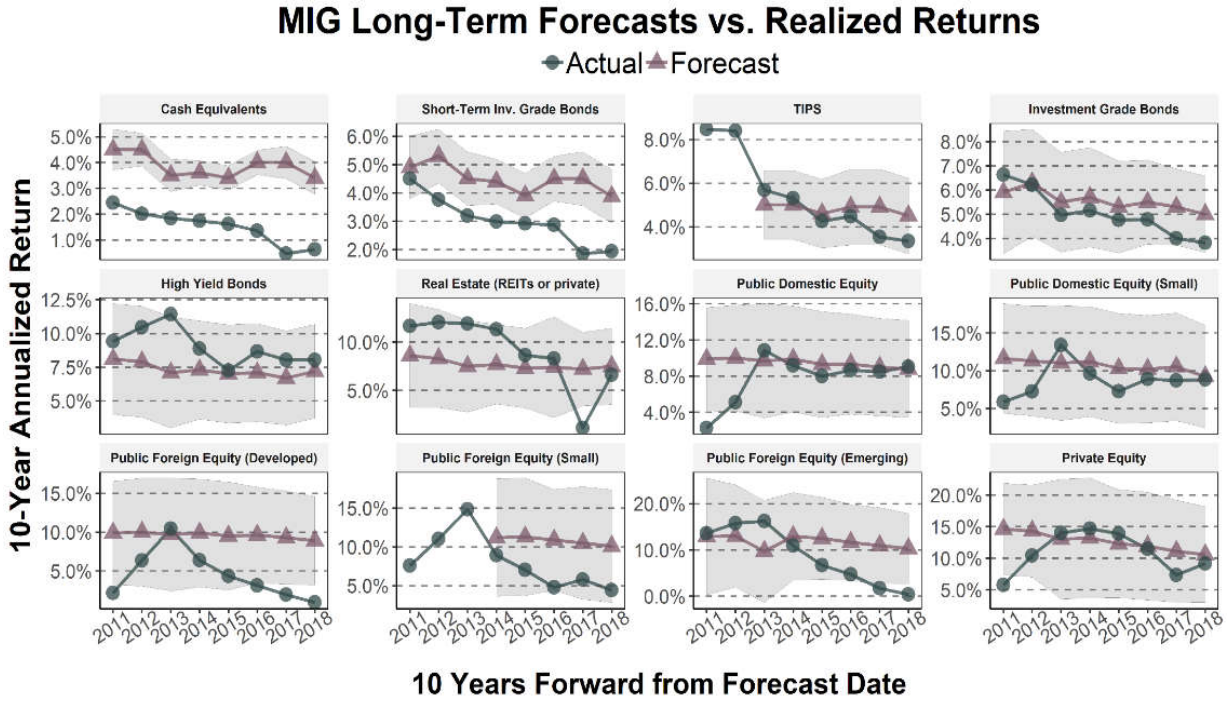
Expected Return	BlackRock 5 Yr (%)	Goldman Sachs 5 yr (%)	Morgan Stanley 5 Yr (%)	GMO 7 Yr (%)	Verus 10 Yr (%)	Meketa 10 yr (%)	Meketa 20 Yr (%)
Federated	6.5	2.7	5.9	0.8	6.4	7.3	7.8
Police and Fire	6.3	2.7	5.7	0.9	6.2	7.0	7.5

Standard Deviation	BlackRock (%)	Goldman Sachs (%)	Morgan Stanley (%)	GMO (%)	Verus (%)	Meketa (%)
Federated	12.1	8.6	10.3	N/A	10.5	11.6
Police and Fire	11.4	8.4	9.8	N/A	10.1	11.0

- The table above compares the expected return and standard deviation for both plans, calculated using a variety of investment firms recently released capital markets assumptions. Unsurprisingly, the short-term expectations tend to be lower than the long-term expectations.

[1] Results calculated by inputting provider capital markets assumptions in Meketa Investment Groups optimizer, except for Verus which was provided. Meketa Investment Group used its discretion when classifying peer assumptions for unprovided asset classes, and these firms may model the asset allocations differently.

Accuracy of Assumptions



- We have kept electronic records of our annual 20-year capital market assumptions since 2001 for major asset classes, so we are able to show the accuracy of our forecasts from 2011 through 2018. The chart above shows how those 20-year forecasts would have performed relative to the realized annual returns with a 1 standard deviation confidence interval in light grey around our forecast assumptions.
- As this graphic shows, our 20-year assumptions were broadly in line with realized outcomes, with the exception of short duration assets like cash and Short Term Investment Grade Bonds, due to surprisingly low rates and inflation over this time period.

Actual Annual Asset Class Returns (Highest to Lowest)[1]

2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	Past 20 Yrs	MIG 2019 20 Yr
Private Equity	EM Equity	High Yield	Real Estate	Private Equity	U.S. Equity	High Yield	Real Estate	EM Equity	EM Equity	Global Macro	Private Equity +12.9%	Private Equity +10.1%
Real Estate	Global Equity	U.S. Equity	Private Equity	Real Estate	Global Equity	EM Equity	Private Equity	Private Equity	High Yield	Global Bonds	Real Estate +8.3%	Real Estate +7.0%
Bank Loans	U.S. Equity	Commodities	U.S. Equity	U.S. Equity	Private Equity	Global Equity	U.S. TIPS	Commodities	Bank Loans	U.S. TIPS	EM Equity +8.1%	EM Equity +10.4%
Relative Value	Private Equity	EM Equity	Relative Value	Global Macro	Equity Hedge	U.S. Equity	Global Bonds	U.S. Equity	Global Equity	Private Equity	High Yield +7.8%	High Yield +6.5%
Global Bonds	Equity Hedge	Bank Loans	Bank Loans	Relative Value	Real Estate	Private Equity	High Yield	Real Estate	U.S. Equity	Real Estate	Relative Value +6.6%	Relative Value +5.1%
U.S. TIPS	High Yield	Real Estate	Equity Hedge	Global Equity	High Yield	Real Estate	Bank Loans	High Yield	Relative Value	Relative Value	Equity Hedge +6.3%	Equity Hedge +5.4%
Global Macro	Real Estate	Private Equity	Global Macro	U.S. TIPS	Relative Value	Relative Value	U.S. Equity	Global Equity	Equity Hedge	Equity Hedge	U.S. Equity +5.6%	U.S. Equity +8.1%
High Yield	Global Bonds	Global Equity	U.S. TIPS	Bank Loans	Bank Loans	Bank Loans	Relative Value	Relative Value	Commodities	High Yield	U.S. TIPS +5.2%	U.S. TIPS +3.6%
U.S. Equity	Relative Value	Relative Value	Global Equity	Equity Hedge	Global Macro	Equity Hedge	Global Macro	Equity Hedge	U.S. TIPS	Bank Loans	Global Equity +5.0%	Global Equity +8.6%
Equity Hedge	Bank Loans	Equity Hedge	High Yield	Global Bonds	EM Equity	U.S. TIPS	Global Equity	Bank Loans	Global Bonds	Commodities	Global Macro +4.9%	Global Macro +5.2%
Global Equity	U.S. TIPS	U.S. TIPS	Global Bonds	High Yield	Global Bonds	Global Bonds	Equity Hedge	Global Macro	Global Macro	U.S. Equity	Bank Loans +4.6%	Bank Loans +6.1%
Commodities	Global Macro	Global Bonds	EM Equity	EM Equity	U.S. TIPS	Global Macro	Commodities	U.S. TIPS	Private Equity	Global Equity	Global Bonds +3.8%	Global Bonds +3.9%
EM Equity	Commodities	Global Macro	Commodities	Commodities	Commodities	Commodities	EM Equity	Global Bonds	Real Estate	EM Equity	Commodities +1.8%	Commodities +5.0%

- Green boxes shown above represent asset classes with positive absolute performance in the designated time period, while red boxes represent asset glasses with negative absolute performance.

[1] As of December 31, 2018.